SAN FRANCISCO ESTUARY PROJECT

Monitoring and Research

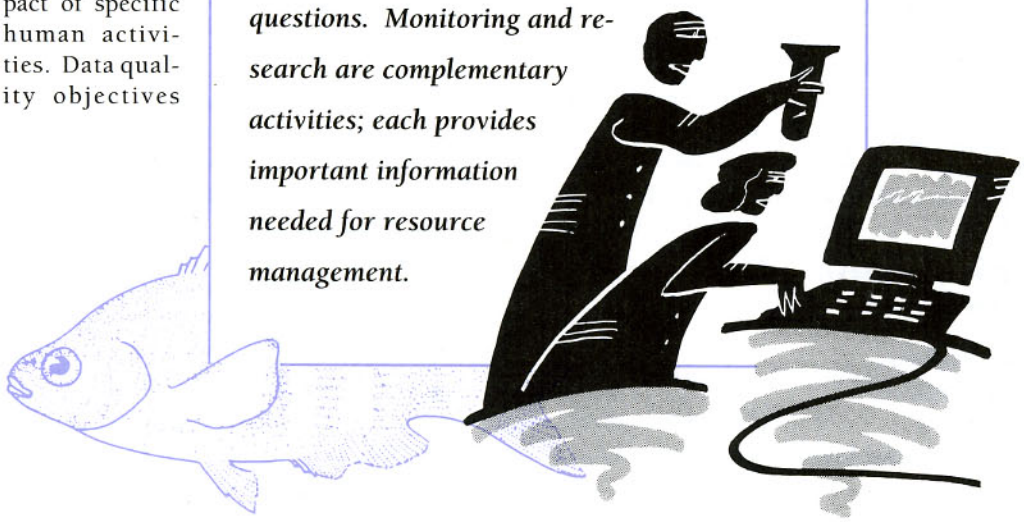
Managing a resource as complex as the San Francisco Bay-Delta Estuary requires a comprehensive understanding both of its biological resources and of human impacts on its ecology. To help facilitate this understanding, the San Francisco Estuary Project is working with government agencies and scientific institutions in an effort to establish a regional monitoring strategy. This strategy will strengthen the Estuary Project's continuing efforts to promote environmentally-sound management of the Bay and Delta.

Wise Management Requires Careful Monitoring

In the San Francisco Estuary, monitoring includes the collection of environmental information such as the number and health of the fish residing in the Estuary, the quality and quantity of freshwater flowing into the Estuary system, and the types and amounts of pollutants. At the moment, Estuary monitoring programs are conducted for a number of diverse applications — each with different design, sampling, analysis and data reduction requirements. The limited scope of some monitoring programs makes it difficult to compare results between different studies.

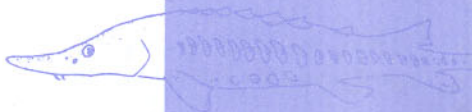
All monitoring programs should provide information about environmental conditions and the impact of specific human activities. Data quality objectives should be specific to the purpose of a given program and at the same time consider other future needs and broader applications to the greatest extent possible. Ideally, those responsible for estuary management would receive monitoring data and information showing the effects that ongoing changes in land use and pollutant loads have on biological habitats , enabling them to develop and select a range of possible options to meet environmental quality goals. These options might include pollutant source control programs, alterations of freshwater inflow, and changes in land uses surrounding the Estuary.

According to the National Research Council, monitoring refers to the repeated collection of data for a specific purpose, usually undertaken to comply with specific regulations; research refers to measurement and experimental programs undertaken to answer more open-ended questions. Monitoring and research are complementary activities; each provides important information needed for resource management.



The Estuary

The West Coast's largest Estuary conveys the waters of two great California rivers—the Sacramento and the San Joaquin—through San Francisco's Delta and Bay and into the Pacific Ocean. The Estuary covers 1600 square miles, drains over 40 percent of the state, circulates about 80-280 million cubic yards of sediment every year and contains about five million acre feet of water at mean tide. The Estuary is also a home or migratory stop for a rich diversity of wildlife. Each year, two-thirds of the state's salmon pass through the Bay and Delta, as well as nearly half of the waterfowl and shorebirds migrating along the Pacific Flyway. Estuary waters also enable the nation's fourth largest metropolitan region to pursue shipping, farming, recreation, fishing, commerce and other activities.



Taken from 1991 Puget Sound Water Quality Management Pl

Planning

History

1816 & 1824 *Russian expeditions—first significant natural history observations of the Estuary.*

1826 *H.M.S. BLOSSOM enters Bay and conducts first extensive survey.*

1862 *Great Flood—Eastern species successfully introduced.*

1888 *USGS collects first stream flow data.*

1912 & 1913 *Biological survey/ expedition by US Bureau of Fisheries steamer the Albatross—first research vessel ever built.*

1917 *First baseline information on Bay's physical characteristics in USGS Hydraulic Mining Report.*

Late 1920s *Salinity incursions prompt studies of water conservation, flood control, navigation.*

1930s *Decision made to build Shasta Dam, little biological information presented as part of the discussion.*

1949 *California Water Quality Control Board and Regional Boards are created.*

1950s *Felice and Jones conduct important studies on Bay benthic environment. Communities and industries required to improve waste treatment facilities.*

1958 *UC begins comprehensive study of Bay; samples included water, sediments, and fish.*

1960-70s *Cooperative regional boards and waste dischargers collect water quality data that is related to self-monitoring programs.*

1962 *Second UC survey of South Bay finds decline in water quality.*

1964 *Bay Conservation and Development Commission established, study begun to develop management plans.*

(continued)

A Comprehensive Approach

The Federal Water Quality Act of 1987 calls for a Comprehensive Conservation and Management Plan (CCMP) which will establish management measures to enhance and protect water quality, natural resources, and uses of the San Francisco Estuary.

As part of CCMP implementation, a comprehensive regional monitoring and research strategy is needed to assess and track the Estuary Project's five management priorities: decline of biological resources; increased pollutants; freshwater diversion; waterway modification and dredging; and intensified land use. Implementation of a more coordinated monitoring strategy will improve our ability to define human–induced stresses, assess the effectiveness of current management, and monitor the long–term health of the Estuary.

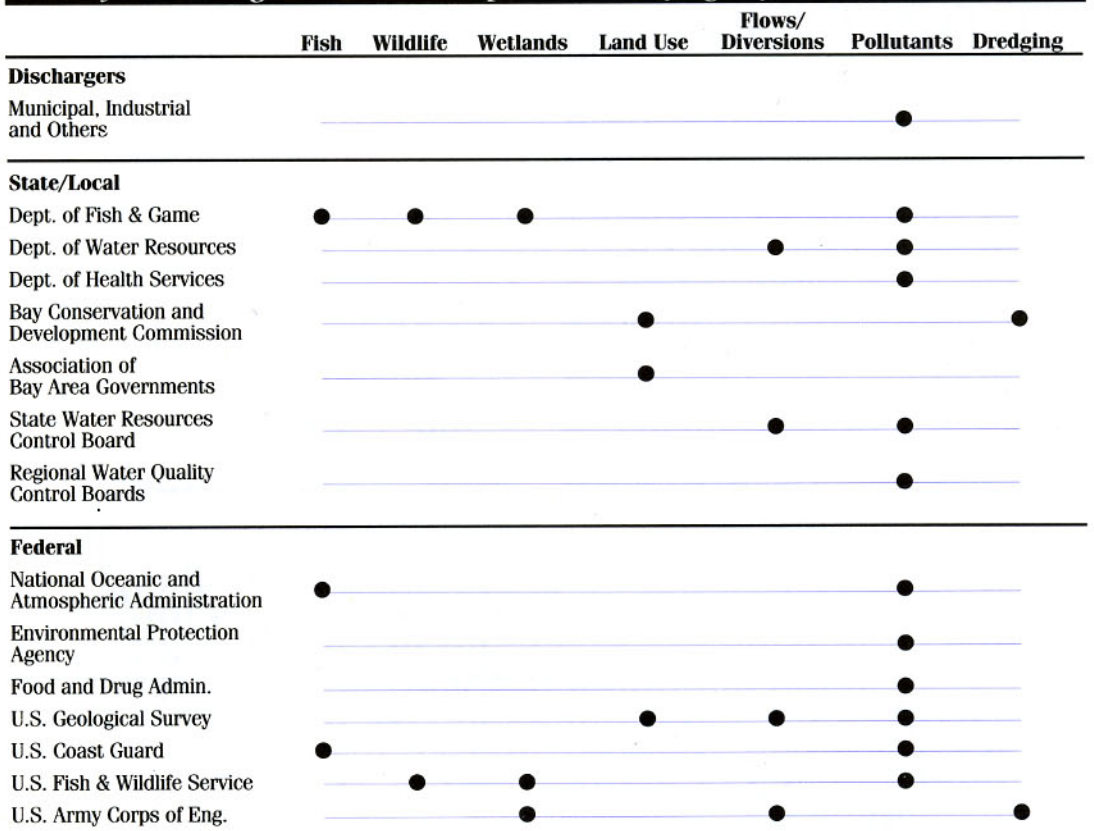
A large number of agencies and private entities, including those discharging wastewater into the Estuary under National Pollution Discharge Elimination System (NPDES) permits, have legal and management responsibilities which require monitoring and research activities in the Estuary. Many of these activities are underway, but the laws and regulatory requirements governing them have created a multiplicity of programs that are sometimes poorly linked and lack a coordinated estuary–wide overview. To help provide this coordination, the San Francisco Estuary Project is fostering a regional estuary–wide monitoring strategy (see back).

By developing such a strategy, the Estuary Project can aid in identifying overlapping program elements and areas not being adequately examined. As new programs are instituted by legislation or regulatory requirements, this new monitoring strategy will provide a framework for integration and implementation of these programs in the most efficient and useful manner.

This approach has proved successful elsewhere. A similar strategy applied in the Puget Sound, for example, helped make an unwieldy,uncoordinated medley of regional monitoring programs more cost–effective and environmentally sound.

The same benefits can be realized in the San Francisco Estuary. Further, this new strategy will provide essential feedback on the effectiveness of the Estuary Project's management activities and decisions.

Primary Monitoring and Research Responsibilities by Agency



Research & Monitoring Projects Underway

National Programs

Several federal agencies conduct monitoring and research programs designed to provide a national data base on the health of the nation's marine and estuarine systems. While these programs are not specifically intended to provide information to local environmental managers, they add to the overall knowledge of the Estuary. Some of the agencies and their programs are:

National Oceanographic and Atmospheric Administration: NOAA is required to conduct programs in estuarine and coastal research and assessment with the aim of predicting future trends. NOAA program objectives are to identify those areas where pollution occurs in coastal and estuarine waters, determine what changes in pollutant concentrations are occurring over time, and document biological responses to pollution. NOAA collects information related to oceanography, geophysical conditions, climate and pollution in the Estuary.

Environmental Protection Agency: EPA's Environmental Monitoring and Assessment Program (EMAP) estimates the current status, extent, and trends of indicators, of the nation's ecological resources. This program currently does not operate in the Estuary. EPA's overall mandate for coastal and marine waters is to protect, restore, and maintain them, to protect human health, sustain living resources, take actions to further reduce pollution of these waters, and to aggressively limit the environmental impact of increasing coastal population.

United States Geological Survey: USGS conducts a wide variety of monitoring and research activities in the San Francisco Estuary as part of a national program. Current USGS research studies include determination of pollutant concentrations in sediment and clams at locations in the southern and northern parts of the Estuary, examination of benthic (Estuary bottom) population dynamics, and maintenance of streamflow gauging stations within the Estuary.

United States Fish and Wildlife Service: USFWS does not have a nationwide estuarine monitoring system, but it does conduct research and monitoring projects in the Estuary. These include: studies on the population, habitat use and contaminant exposure of wintering waterfowl in the Estuary; effects of contaminants on small mammals in the San Francisco Bay; and monitoring of wildlife and their habitats, particularly those threatened and endangered species in the Estuary.

Food and Drug Administration: FDA's National Shellfish Sanitation Program monitors shellfish harvested for human consumption.

Regional Programs

Principal responsibility for pollution control lies with the State Water Resources Control Board (SWRCB) and its Regional Water Quality Control Boards. The Regional Boards require monitoring and reporting of municipal and industrial effluent discharges within their jurisdiction as conditions of NPDES permits.

State Water Resources Control Board: The SWRCB, since 1976, has funded the Toxic Substances Monitoring and State Mussel Watch Programs which are carried out by the Department of Fish and Game. The objectives of these programs, similar to NOAA's Status and Trends Program and EPA's EMAP, are to document the availability of toxic pollutants to aquatic organisms by monitoring pollutant concentrations in estuarine animals.

Regional Water Quality Control Board: The San Francisco Board is working to improve the overall knowledge of pollutant concentration trends in the Estuary. The Board recently launched a new program in which 46 dischargers will expand localized monitoring into a more cooperative, regional effort. The Central Valley Board is conducting a study of biotoxicity in the San Joaquin and Sacramento Rivers.

1968 & 1977 *D-1379 and D-1485 Water Rights Decisions, SWRCB establish operational conditions for the State Water Project.*

1969 *Porter-Cologne Water Quality Control Act passed.*

1969 *Bay-Delta Water Quality Control study completed, recommending comprehensive wastewater plan for the Bay, embodied in regional board's basin plans.*

1970 *Interagency Ecological Study Program established.*

1977 *US Army Corps of Engineers completes Dredge Disposal Study, found dredge material did not pose threat to estuarine aquatic organisms.*

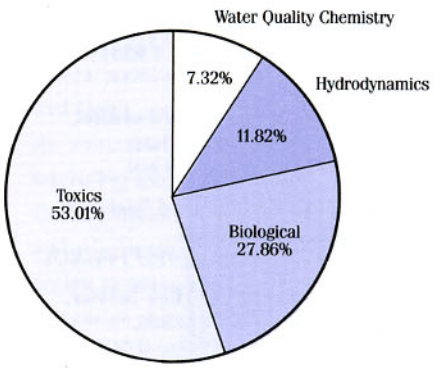
1982 *Aquatic Habitat Institute established with interests in research and monitoring in the Estuary.*

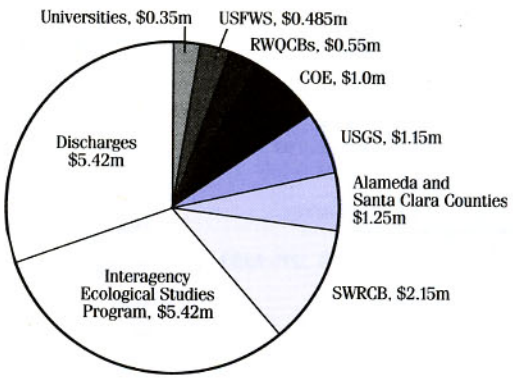
1988 *San Francisco Estuary Project established under Water Quality Act of 1987.*

Gaps and New Grants

The Estuary Project and other agencies have identified a number of gaps in knowledge requiring additional scientific research. These include understanding the distribution or abundance of pollutants in the water, sediments and aquatic life of the Estuary and gaining more information about various species of fish and wildlife, their habitats and the contaminants they encounter. To more fully engage the academic community in this effort, the Estuary Project and the Interagency Ecological Studies Program (see back) are awarding grants under an Academic Research and Involvement Program to support field study work.

Expenditure by Research Area





1990 Monitoring Acitivities

Agency Budget (million $)

Total Monitoring Costs=$17.77m

Coordination Efforts

Contacts

Central Valley Regional Water Quality Control Board, *3443 Routier Road, Sacramento, CA 95827-3098 (916) 361-5600*

Calif. Dept. of Fish and Game, *1416 Ninth Street, Sacramento, CA 95814 (916) 653-7664*

Calif. Dept. of Water Resources, *P.O. Box 942836, Sacramento, CA 94136-0001 (916) 653-9712*

Interagency Ecological Study Program, *C/O Calif. Dept. of Water Resources, 3251 S. Street, Sacramento, CA 95816-7017 (916) 322-7165*

National Oceanic and Atmospheric Administration/National Marine Fisheries Service, *777 Sonoma Avenue, Room 325, Santa Rosa, CA 95404 (707) 578-7513*

S.F. Bay Conservation and Development Commission, *30 Van Ness Avenue,#2011, San Francisco, CA 94102 (415) 557-3686*

S.F. Bay-Delta Aquatic Habitat Institute, 180 Richmond Field Station, *1301 South 46th Street, Richmond, CA 94804 (510) 231-9539*

S.F. Bay Regional Water Quality Control Board, *2101 Webster Street, Suite 500, Oakland, CA 94612 (510) 464-1255*

San Francisco Estuary Project, *P.O. Box 2050, Oakland, CA 94604-2050 (510) 464-7990*

State Water Resources Control Board, *901 P Street, Sacramento, CA 95814 (916) 657-2390*

United States Bureau of Reclamation, *2800 Cottage Way, Sacramento, CA 95825-1898 (916) 978-4919*

United States Army Corps of Engineers, S.F. Dist., *211 Main Street, San Francisco, CA 94105 (415) 744-3276*

United States Fish & Wildlife Service, *2800 Cottage Way, Room 1803, Sacramento, CA 95825 (916) 978-4613*

United States Food & Drug Administration, Shellfish Sanitation Program, *50 United Nations Plaza, San Francisco, CA 94102 (415) 556-5437*

United States Environmental Protection Agency, *75 Hawthorne Street, San Francisco, CA 94105 (415) 744-2125*

United States Geological Survey, *345 Middlefield Road, Menlo Park, CA 94025 (415) 329-4000*

Dredging

A joint federal and state effort is being made to develop a Long Term Management Strategy (LTMS) for dredged material disposal in the Bay region. The U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the San Francisco Bay Regional Water Quality Control Board and the San Francisco Bay Conservation and Development Commission are working together to create a program for research necessary to complete the LTMS process. Studies now underway range from surveys of physical and biological oceanography to analyses of suspended sediment effects—both chemical and physical—on water quality and biota. EPA recently completed studies needed for evaluation of ocean disposal sites.

Ecological Studies

The Interagency Ecological Study Program (IESP) was recently restructured with the aim of achieving greater estuary-wide knowledge. The IESP includes five areas of study and has eight agency participants (California Department of Fish and Game, California Department of Water Resources, U. S. Bureau of Reclamation, U.S. Environmental Protection Agency, U. S. Fish and Wildlife Service, U.S. Geological Survey, California State Water Resources Control Board, and U.S. Army Corps of Engineers), and has a 1992-93 budget of $10.1 million. Areas of study include:

- ***Fisheries***–The studies focus on resident Delta fish as well as Striped bass and salmon.
- ***Water Quality***–The primary emphasis is the refinement of models that can be used to assess the impacts of water development alternatives on phytoplankton populations.
- ***Fish Facilities***–The study's purpose is to obtain a better understanding of effects of existing Delta pumping facilities on fish and proposing alternatives.
- ***Delta Outflow/San Francisco Bay Study***–The study provides information on the need for outflow standards to protect the Bay portion of the Estuary. Designed primarily to address the issue of operational effects of State and Federal water projects on fish and wildlife populations, the outflow study considers a broad array of concerns including pollutants transport, alternative flow regimes, and habitat alteration.
- ***Data Management***–The data management system provides participating agencies with accuracy and access to computer stored data that has been collected by the various IESP studies.

A New Regional Strategy

Development of a regional monitoring strategy as part of the Estuary Project's CCMP will be accomplished by reliance on, and interaction with, important programs already underway. These include: 1) the Aquatic Habitat Institute's Framework for Monitoring and Research in the San Francisco Bay–Delta; 2) the Regional Monitoring Program with a focus on toxics being developed by the San Francisco Bay Regional Water Quality Control Board; 3) the Long Term Management Strategy for dredged material disposal in the Estuary being developed by a federal and state effort, with the U.S. Army Corps of Engineers acting as lead agency and; 4) the IESP's recently revised estuary-wide monitoring program.

The Estuary Project's ***Comprehensive Conservation and Management Plan*** *(CCMP) for the Bay & Delta presents the following goals for research and monitoring:*

- *Improve the scientific basis for managing the natural resources within the Estuary.*
- *Optimally monitor pollutants, dredging and waterway modification, fish and other aquatic resources, wildlife, wetlands, and land use within the boundaries of the Estuary using new and existing facilities, agencies, and public involvement groups.*

To achieve these goals, the CCMP recommends actions such as the establishment of a San Francisco Estuarine Institute and the development and implementation of a regional monitoring strategy.

A product of the San Francisco Estuary Project Technical Program, August 1992 Design: N. Lisowski